Claims

1. A liquid crystal display device comprising:

a first substrate including a plurality of unit cells, each of the unit cells having i) a sensor thin film transistor for receiving a light reflected from a fingerprint to generate electric charges corresponding to an intensity of the reflected light, ii) a storage device for storing the electric charges, iii) a first switch thin film transistor for receiving the electric charges from the storage device to output the electric charges in response to an external control signal;

a first transparent electrode disposed on a lower surface of the first substrate;

a second substrate including a pixel, the pixel having i) a second switch thin film transistor, ii) a data line electrically coupled with a first electrode of the second switch thin film transistor, iii) a gate line electrically coupled with a second electrode of the second switch thin film transistor, iv) a color filter layer formed on first portions of the gate line, the data line and the second switch thin film transistor, v) a second transparent electrode formed on the color filter layer and electrically coupled with a second portion of the first electrode; and

a liquid crystal layer interposed between the first and second substrates.

2. The liquid crystal display device of claim 1, wherein the second substrate further comprises a first insulation layer disposed between the color filter layer and the second transparent electrode to cover the color filter layer, the first insulation layer electrically coupled with the second portion of the first electrode.

3. The liquid crystal display device of claim 1, wherein at least two unit cells is arranged over one pixel.

4. The liquid crystal display device of claim 3, three unit cells are arranged over the pixel having a first aspect ratio of 1:3, each of the unit cells having a second aspect ratio of 1:1.

5. The liquid crystal display device of claim 4, wherein the first substrate further comprises a sensor signal output line for outputting a sensing signal, the sensor signal output line connected with the sensor thin film transistor, the gate line and a third electrode of the sensor thin film transistor, and the sensor signal output line comprised of transparent conductive material.

6. The liquid crystal display device of claim 1, wherein the first substrate further comprises a second insulation layer covering the sensor thin film transistor, the storage device and the first switch thin film transistor.

7. The liquid crystal display device of claim 6, wherein the first switching thin film transistor comprises:

a channel region comprised of amorphous silicon; and

a light shielding layer, disposed on a third portion of the second insulation layer, for shielding the channel region from the light reflected from the fingerprint, the third portion disposed over the channel region, and the light shielding layer comprised of Cr/Cr_XO_Y.

8. The liquid crystal display device of claim 6, wherein the first switching thin film transistor comprises:

a channel region comprised of amorphous silicon; and

a light shielding layer, disposed over the channel region, for shielding the channel region from the light reflected from the fingerprint, and the light shielding

layer comprised of Cr/Cr_XO_Y.

9. The liquid crystal display device of claim 1, wherein the liquid crystal display device further comprises:

a data reading part, disposed adjacent to a first side face of the first substrate to be connected to the first side face of the first substrate, for receiving the charges from a first electrode of the first switch thin film transistor to generate a fingerprint identification signal corresponding to the fingerprint;

a first gate driver part, disposed adjacent to a second side face of the first substrate to be connected to the second side face of the first substrate, for turning on or turning off a second electrode of the first switch thin film transistor and a second electrode of the sensor thin film transistor;

a data driver part, disposed adjacent to a first side face of the second substrate to be connected to the first side face of the second substrate, for applying an image data signal to a third electrode of the second thin film transistor through the data line; and

a second gate driver part, disposed adjacent to a second side face of the second substrate to be connected to the second side face of the second substrate, for turning on or turning off the second electrode of the second switch thin film transistor, wherein the data driver part is opposite to the data reading part and the first gate driver part is opposite to the second gate driver part.

10. A method of manufacturing a liquid crystal display device, the method comprising:

forming a sensor thin film transistor, a storage device and a first switch thin film transistor and on a first substrate comprised of insulation material, the sensor thin film transistor receiving a light reflected from a fingerprint to generate electric

charges corresponding to an intensity of the reflected light, the storage device storing the electric charges, and the first switch thin film transistor receiving the electric charges from the storage device to output the electric charges in response to an external control signal;

forming a first transparent electrode on a lower surface of the first substrate;

forming a second switch thin film transistor, a data line and a data line on a second substrate comprised of insulation material, the data line electrically coupled with a first electrode of the second switch thin film transistor, and the gate line electrically coupled with a second electrode of the second switch thin film transistor,

forming a color filter layer on first portions of the gate line, the data line and the second switch thin film transistor;

forming a second transparent electrode on the color filter layer, the second transparent electrode electrically coupled with a second portion of the first electrode of the second switch thin film transistor; and

forming a liquid crystal layer between the first and second substrates.

11. The method of manufacturing the liquid crystal display device of claim 10, wherein the method further comprises forming a first insulation layer between the color filter layer and the second transparent electrode to cover the color filter layer, the first insulation layer electrically coupled with the second portion of the first electrode.

12. The method of manufacturing the liquid crystal display device of claim 10, wherein the method further comprises forming a second insulation layer on the sensor thin film transistor, the storage device and the first switch thin film transistor, the second insulation layer covering the sensor thin film transistor, the storage device and the first switch thin film transistor.

13. The method of manufacturing the liquid crystal display device of claim 12, wherein the method further comprises:

forming a channel region comprised of amorphous silicon; and

forming a light shielding layer at a third portion of the second insulation layer, the third portion disposed over the channel region, the light shielding layer shielding the channel region from the light reflected from the fingerprint, and the light shielding layer comprised of Cr/Cr_XO_Y.

14. The method of manufacturing the liquid crystal display device of claim 13, wherein the method further comprises:

forming a channel region comprised of amorphous silicon; and

forming a light shielding layer, disposed over the channel region, for shielding the channel region from the light reflected from the fingerprint, and the light shielding layer comprised of Cr/Cr_XO_Y.

15. A method of manufacturing the liquid crystal display device, the method comprising:

forming a sensor thin film transistor, a storage device and a first switch thin film transistor and on a first substrate comprised of insulation material, the sensor thin film transistor receiving a light reflected from a fingerprint to generate electric charges corresponding to an intensity of the reflected light, the storage device storing the electric charges, and the first switch thin film transistor receiving the electric charges from the storage device to output the electric charges in response to an external control signal;

forming a first transparent electrode on a lower surface of the first substrate;

forming a second switch thin film transistor on a second substrate comprised

of insulation material;

forming a color filter layer on the second switch thin film transistor;

forming a second transparent electrode on the color filter layer;

aligning the first substrate over the second substrate base on a first aspect ration for a first pixel unit of the first substrate and a second aspect ration for a second pixel unit of the second substrate; and

forming a liquid crystal layer between the first and second substrates.

16. The method of manufacturing the liquid crystal display device of claim 15, wherein the method further comprises forming a first contact hole on the color filter, the first contact hole exposing a first portion of a first electrode of the second switch thin film transistor.

17. The method of manufacturing the liquid crystal display device of claim 16, wherein the method further comprises forming a second contact hole on the second transparent electrode, the second contact hole exposing a second portion of the first electrode of the second switch thin film transistor, the second portion corresponding to the first portion of the first electrode of the second switch thin film transistor.

18. The method of manufacturing the liquid crystal display device of claim 17, wherein the method further comprises forming a first insulation layer between the color filter layer and the second transparent electrode to cover the color filter layer, the first insulation layer having a third contact hole that exposes the second portion of the first electrode of the second switch thin film transistor.

19. The method of manufacturing a liquid crystal display device of claim

18, wherein the method further comprises forming a second insulation layer on the sensor thin film transistor, the storage device and the first switch thin film transistor, the second insulation layer covering the sensor thin film transistor, the storage device and the first switch thin film transistor.

20. The method of manufacturing a liquid crystal display device of claim 19, wherein the method further comprises:

forming a channel region comprised of amorphous silicon; and

forming a light shielding layer at a third portion of the second insulation layer, the third portion disposed over the channel region, the light shielding layer shielding the channel region from the light reflected from the fingerprint, and the light shielding layer comprised of Cr/Cr_XO_Y.

21. The method of manufacturing a liquid crystal display device of claim 15, wherein the method further comprises:

forming a channel region comprised of amorphous silicon; and

forming a light shielding layer, disposed over the channel region, for shielding the channel region from the light reflected from the fingerprint, and the light shielding layer comprised of Cr/Cr_XO_Y.

22. The method of manufacturing a liquid crystal display device of claim 15, wherein the method further comprises:

connecting a data reading part to a first side face of the first substrate, the data reading part being disposed adjacent to the first side face of the first substrate and receiving the charges from a first electrode of the first switch thin film transistor to generate a fingerprint identification signal corresponding to the fingerprint;

connecting a first gate driver part to a second side face of the first substrate, the first gate driver part being disposed adjacent to the second side face of the first substrate and turning on or turning off a second electrode of the first switch thin film transistor and a second electrode of the sensor thin film transistor;

connecting a data driver part to a first side face of the second substrate, the data driver part being disposed adjacent to the first side face of the second substrate and applying an image data signal to a third electrode of the second thin film transistor through the data line; and

connecting a second gate driver part to a second side face of the second substrate, the second gate driver part being disposed adjacent to the second side face of the second substrate and turning on or turning off the second electrode of the second switch thin film transistor, wherein the data driver part is opposite to the data reading part and the first gate driver part is opposite to the second gate driver part.

23. A liquid crystal display device comprising:

a first substrate including a plurality of unit cells, each of the unit cells having i) a sensor thin film transistor for receiving a light reflected from a fingerprint to generate electric charges corresponding to an intensity of the reflected light, ii) a storage device for storing the electric charges, iii) a first switch thin film transistor for receiving the electric charges from the storage device to output the electric charges in response to an external control signal;

a first transparent electrode disposed on a lower surface of the first substrate;

a second substrate;

a pixel including i) a data wiring having a data line formed in the second substrate, ii) a color filter layer on the second substrate on which the data wiring is formed, the color filter layer covering a first portion of the data wiring, iii) an insulation layer covering the data wiring and the color filter layer, iv) a second

switch thin film transistor formed on the insulation layer, and v) a second transparent electrode electrically coupled with a second portion of a first electrode of the second switch thin film transistor; and

a liquid crystal layer interposed between the first and second substrates.

24. The liquid crystal display device of claim 23, three unit cells are arranged over the pixel having a first aspect ratio of 1:3, each of the unit cells having a second aspect ratio of 1:1.

25. The liquid crystal display device of claim 24, wherein the first substrate further comprises a sensor signal output line for outputting a sensing signal, the sensor signal output line being connected to the sensor thin film transistor, the gate line and a third electrode of the sensor thin film transistor, and the sensor signal output line being comprised of transparent conductive material.

26. The liquid crystal display device of claim 23, wherein the first substrate further comprises a second insulation layer covering the sensor thin film transistor, the storage device and the first switch thin film transistor.

27. The liquid crystal display device of claim 26, wherein the first switching thin film transistor comprises:

a channel region comprised of amorphous silicon; and

a light shielding layer, disposed on a third portion of the second insulation layer, for shielding the channel region from the light reflected from the fingerprint, the third portion disposed over the channel region, and the light shielding layer comprised of Cr/Cr_XO_Y.

28. The liquid crystal display device of claim 26, wherein the first switching thin film transistor comprises:

a channel region comprised of amorphous silicon; and

a light shielding layer, disposed over the channel region, for shielding the channel region from the light reflected from the fingerprint, and the light shielding layer comprised of Cr/Cr_XO_Y.